Contribution ID: **56** Type: **Oral**

Multiplicities, p_T spectra and v_2 in A+A collisions at LHC and RHIC from NLO-improved pQCD + saturation + hydrodynamics model

Thursday, 7 November 2013 16:20 (20 minutes)

We report the results from the recent studies [1,2], where we have brought the EKRT framework [3] to next-to-leading order (NLO) in pQCD, and shown the viability of the model in describing the produced initial QGP energy densities at the LHC and RHIC.

Our updated framework [1] combines a rigorous NLO pQCD computation of the minijet transverse energy production with the saturation of gluons and fluid dynamics. Latest knowledge of NLO nuclear parton distributions (nPDFs) is utilized. Identifying the key parameters and charting the uncertainties of the model, we obtain an encouragingly good agreement with the charged-particle multiplicities and identified bulk hadron p_T spectra measured in 5% most central Au+Au collisions at RHIC and Pb+Pb at the LHC [1].

To obtain the initial QGP energy-density profiles dynamically in non-central collisions [2], we supplement the calculation by a local saturation condition and impact-parameter dependent nPDFs (EPS09s [4]). We address the main uncertainties associated with the obtained initial states. Using viscous fluid dynamics, we show that a good simultaneous description of the centrality dependence of multiplicity, p_T spectra and elliptic flow is obtained both at the LHC and RHIC.

Ref. [1]
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Phys. Rev. C87 (2012) 044904.

Ref. [2]
R. Paatelainen, K.J. Eskola, and H. Niemi, work in progress.

Ref. [3]
K.J. Eskola, K. Kajantie, P.V. Ruuskanen, K. Tuominen,
Nuc. Phys. B570 (2000) 379.

Ref. [4]
I. Helenius, K.J. Eskola, H. Honkanen and C.A. Salgado,
JHEP 1207 (2012) 073.

Keywords

initial state, QGP

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Session Classification: Initial State and Proton-Nucleus Collision Phenomena

Track Classification: Initial State and Proton-Nucleus Collision Phenomena